they have brought to bear the scientific training they had received at their universities and polytechnic schools. Thus they have already, in many fields formerly remunerative to British manufacturers, distanced the latter, immensely aided though these be by their long occupation of the ground and by permanent natural advantages, such as cheapness of coal and of freight, superior command of capital, &c., and this is likely to go on to an increasing extent if many British chemical manufacturers decline to profit from a scientific study of their respective branches. This is all the less excusable, as England from of old has been a stronghold of scientific chemistry, and can hold its own against the whole world in that respect."

To these words I will only add that one of the best possible signs of advancement in the study of science so necessary for the permanent well-being of our manufactures would be to find well-thumbed copies of Dr. Lunge's three volumes not only on the alkali-maker's shelves, but in the house of every manager, and on the table of every free library in the manufacturing districts.

H. E. ROSCOE

OUR BOOK SHELF

Aide-Mémoire du Voyageur. Par D. Kaltbrunner. (Zurich: Wurster et Cie., 1881.)

THIS is a sort of supplement to the "Manuel du Voyageur" by the same author, noticed in these pages at the time of its appearance. The present volume may be described as a collection of constants in all departments of science likely to be of service to the scientific traveller, and indeed to students of many kinds. It contains a series of sections in geography (mathematical, physical, and political), geology, biology, and anthropology. To each section is prefixed a list of works to be consulted on the particular subject, numerous plates and maps, an index, and a table of authors whose works are cited. The whole work seems to us well put together, the information really useful, and, so far as we have tested, trustworthy, though the lists of works are not always so complete as they might be; this can be easily amended in subsequent editions. To all interested in geography in its widest sense, the work must prove of real service.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Geological Climates

I SHOULD not say more on this subject, but that the last paragraph of Mr. Starkie Gardner's letter seems to imply that I have adopted some of his views without acknowledgment. Now I certainly read his article in NATURE of December 12, 1878, with much interest and profit; but, as regards the special question of the cause of the mild climates of Eocene and Miocene times, I entirely disagreed with his views, as is sufficiently shown by my recent letter in NATURE. I quite admit that the closing up of the North Atlantic between Europe and North America *might* have considerably raised the temperature of Britain, but it would just as certainly have rendered the Arctic regions even colder than they are now, by shutting out the Gulf Stream, whereas all the evidence points to *continuous* mild Arctic climates through Cretaceous, Eocene, and Miocene times. Again, though I admit that there has probably, on more than one occasion during the Tertiary period, been a land connection between North-West Europe and North-East America, yet the peculiar distribution of the Tertiary mammalia of Europe and North America indicates that such connection was exceptional, and only endured for very short periods, the rule being a separation like that which now exists. I could therefore only have quoted Mr. Gardner's view to disagree with it; and I did not think it advisable to encumber the exposition of my own theory with more references of this kind than were absolutely necessary. I may add, that the extension of the Miocene Arctic flora to Grinnell Land since Mr. Gardner's article appeared, renders his views still more untenable. Of course I here refer to my chapter on "Mild Arctic Climates" in "Island Life." In my letter to NATURE I confined myself strictly to the point raised by Prof. Haughton, which I did not consider had been adequately met by Mr. Gardner's hypothesis.

ALFRED R. WALLACE

Is your correspondent, Mr. Ingram of Belvoir Castle, quite certain that he has not confused the *Araucaria Cunninghami* of Queensland with *Cunninghamia lanceolata* of China? The names are misleading.

H. KING

Chithurst, Petersfield

Temperature of the Breath

FROM time to time during the past few months letters on "the temperature of the breath" have appeared in NATURE, and some conjectures have been advanced regarding the cause of the high temperatures produced by breathing on thermometers enveloped in silk or other materials.

One of the correspondents supposes that the high temperature thus produced indicates a cooling action of the breath. The refrigerating agency of respiration by the heating of respired air and by evaporation from the lungs is sufficiently well known, and has been calculated by Helmholtz; but it is scarcely logical to ascribe to the breath a temperature so obviously produced by the intervention of another agent, and this hypothesis would involve the rejection of all observations hitherto made by physiologists on the temperature of the breath and of the blood.

A few lines which appeared in NATURE of October 7 indicated what appeared to me to be the simple and philosophical explanation (*i.e.* hygroscopic condensation) of the phenomenon under discussion. The higher temperatures produced in dry than in wet weather, and by some materials than by others, distinctly point to the hygroscopic state and nature of the material as the modifying influences.

The question is entirely physical, and not physiological. Wrapping the thermometer is a new factor in taking the temperature of the breath, and is, *primâ facie*, the cause of the high temperature. Some further experiments which I have just completed place the matter beyond all doubt. Not to occupy your space with unnecessary details, I give only an outline of them:—

1. A current of air directed upon the bulb of a naked thermometer caused no appreciable rise; neither did the mercury rise when the bulb was enveloped in silk; but when it was enveloped in *dried* silk it rose several degrees. (The silk was dried by heat, and allowed to cool in a stoppered bottle.)

2. Three thermometers—(1) bulb naked, (2) bulb wrapped in silk, (3) bulb wrapped in *dried* silk—placed in a current of *hot damp* air for some minutes, marked respectively 116°, 120°, and 123° F.

3. Two thermometers, one naked, the other wrapped in silk, were placed in a flask, with their stems passed through the cork. The flask was then immersed in hot water (about 150° F.). The naked thermometer rose rapidly, the covered one very slowly. After twenty minutes the temperature of the water was 120°, and the naked thermometer marked 112°, while the covered one registered only 108°.

4. Two thermometers, one naked, the second wrapped in dried silk, were fixed in a flask as for last experiment, but a little water was placed in the flask, which was then plunged into hot water as before. The naked thermometer rose rapidly at first, but it was soon outstripped by the covered one. The following was the result after some minutes:—Water, 128°; naked thermometer, 118°; covered thermometer, 136°.

5. Two thermometers, one naked, the second enveloped in dried silk, were passed through a cover fitting a glass vessel which was carefully dried and heated, and the cover was cemented on to prevent the passage of moisture from the air. After an hour the naked thermometer had cooled to 81° (temperature of air), and the covered one to 83°. They were then changed to a similar vessel containing a little water; the

© 1881 Nature Publishing Group

covered thermometer rose rapidly till it nearly touched 94°, while, the naked one remained stationary.

The conclusions to which these experiments point are too obvious to require demonstration. C. J. McNALLY

Madras, December 9, 1880

Selenium

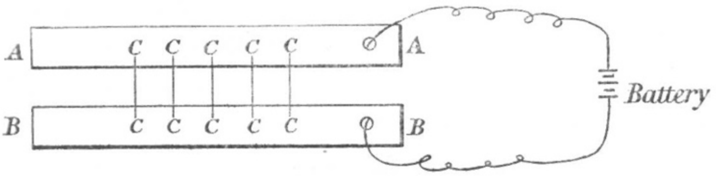
THE use of selenium in the photophone has suggested to me the possibility of using it in two ways, which I shall now describe, thinking you may perhaps consider them of sufficient general interest to publish in NATURE.

Firstly, it seems probable that selenium might be used to obtain the automatic registration in a chronograph of such phenomena as star transits. It possesses the property of being drawn into fine wire at a low temperature, but whether it can be drawn fine enough to represent transit wires in a telescope I do dot know.

The arrangement would be as shown in the diagram, where A A B B are parallel metal plates crossing the field of the telescope, and insulated from each other except by the selenium wires C C C C in one direction, and by a wire circuit passing through a battery, and a relay, R, in the other. The relay should be so adjusted that the increased force of the current passing through the circuit caused by the light of a star falling on each wire C C in succession, shall cause its armature to act, and pass on a signal to the chronograph.

The delicacy of the adjustment required for this purpose might be a greater difficulty than I am aware of; but it should be borne in mind that the length of selenium in the circuit may be very small, as the plates A A B B need not be farther apart than sufficient to insure the star's falling between them without excessive accuracy of setting, say one-twentieth to one-tenth of an inch in a telescope of moderate size. If necessary, it would be simple enough to give each wire C C its own distinct circuit. Should the brittleness of the wires prove a difficulty, they may be supported between the plates A A B B in any convenient way which does not interfere with the insulation of these plates.

The second purpose would perhaps be of more practical use than the above, viz. to secure an automatic daily time-signal.



Let a thin plate of selenium be placed between, and in close contact with, two parallel plates of metal, which are connected with each other by a wire passing through a battery and a relay as above, so that the selenium alone interrupts the circuit. Then if this plate be placed with its length in the meridian, and a lens adjusted above it, so as to throw the image of a star, or the sun, as it crosses the meridian exactly on the selenium, a signal will be obtained from the relay as before, which in this case may be the stroke of a bell or any other convenient sound.

An ordinary lens would require constant changes of adjustment if used for the sun, moon, or any body of varying declination; but if the lens were the central slice cut out of a sphere by two small circles parallel to each other and equidistant from the centre, placed with its flat sides parallel to the meridian, while the selenium was placed in a curve concentric with that of the lens, at the proper distance from its surface, and of sufficient length—of course being accurately in the meridian—then any heavenly body of whatever declination—between certain wide limits—would throw its image on the selenium and afford a signal, if of sufficient brightness. The arrangement of a warning-signal would be easy.

If this method proved practicable the objection would remain of having to apply a correction to obtain mean time, which would probably prevent its being used for public purposes, such as dropping time-balls or firing time-guns. It seems to me however that it might nevertheless prove very useful to many private individuals who require an accurate knowledge of time.

Poona, December 3, 1880 W. M. C.

Experiments with Vacuum Tubes

AT a meeting of the Philosophical Society of Glasgow on December 22, 1880, I gave a very brief preliminary account of some experiments that I have been making, along with Sir William Thomson, with vacuum tubes. We have sealed up English and German glass tubes with very high vacuums, but without any electrodes; and have obtained very remarkable luminous effects both with the Ruhmkorf coil and also working by means of electrostatic induction. Using an ordinary frictional electric machine, and applying one end of a long vacuum tube to the prime conductor, while the other end of the tube is held in the hand, the tube becomes charged as a double Leyden jar in the following way:—one end of the tube, next to the prime conductor,—outside positive, inside negative; the other end—inside positive, outside negative. This can be shown by the gold leaf electroscope. The charges seem to be very high and the glass is very frequently perforated. Indeed it is difficult to work with the electric machine in tolerably good order without perforating the glass. While this double Leyden jar is slowly discharged, by removing, part by part, the charges from the outside of the tube, beautiful luminous effects are observed very different from those seen in the ordinary vacuum tubes. We have also obtained curious effects by heating the middle region of the tube so highly that it becomes a semi-conductor. J. T. BOTTOMLEY

Physical Laboratory, University, Glasgow, December 29

Modern Use of Ancient Stone Implements

PERHAPS the following statement will interest some of your readers:—In an old volume, "Thomae Bartolini Acta hafniensia," Ann. 1674, 1675, 1676, I find a paragraph signed by Olaus Borrichius, which clearly indicates that in the seventeenth century ancient stone implements, and probably many of them, were converted into flints for the use of the contemporaneous musquetry. The text runs thus:—"Silices Anholdini triangulares. Insula haec [Anholt in the Kattegat] porrigitur in sinu codano, minuta illa quidem et naufragiis multorum infamis, uno hîc laudanda quod si quis arenas littoris eiusdem scrutetur, infinitos reperiat silices nigros, albos, varios, in sabulo hinc inde sepultos, ad sex transversos digitos in longitudinem protensos, latos digitum unum, omnes triquetros ac si manu artificis fuissent acuminati, et lateribus plerumque in illam aciem excitatis, ut Iosuae servire potuerint cultris saxeis filiorum Israel circumcisionem imperanti. Nunc ferreo hic seculo in alios vocantur usus: malleo enim in frusta convenientia divisi sclopetorum rotulis ignem prompte ministrant et fomitis incendiarii loco fulmineis bellatorum tubis ancillantur." D. BUDDE

Rome, December 26, 1880

Pile Dwellings

IF the connection between pile dwellings in the Swiss lakes, the Swiss châlet, and the Malayan modern pile dwellings is demonstrated, a decided advance has been or will be made in prehistoric anthropology.

Pile dwellings are a very distinct characteristic of all the Hill races north-east of Bengal, except those on the Kasia Hill ranges, and so far as I can see is a conspicuous distinction between the Aryan and non-Aryan races here.

The persistence with which this custom is retained among tribes who have migrated to new sites, where the need is not obvious, seems to offer a safe means of tracing to some extent racial descent or relationships.

The "Miris" of Asam offer a case where part of the tribe is still in its hills, while the rest are more or less scattered along the Brahmaputra in the level land of Asam, and build houses alike. The Ahoms, a Shan race who invaded and settled in Asam in A.D. 1228, built pile dwellings, and the "Deodhaings," who are lineally descended from them, do so now. The Butias

© 1881 Nature Publishing Group